FACULTY OF SCIENCE

B.Sc. (Microbiology) (Semester-3)

In Effect from Academic Year 2017-18

Subject Code: 1SC1020302	Subject Title: ENVIRONMENTAL MICROBIOLOGY
COURSE TYPE: CORE COURSE	

Course Objective:

Environmental Microbiology deals with the habitats, diversity and interactions existing among microorganisms present in different habitats. Microorganisms inhabiting various habitats such as water, soil, rhizosphere, etc grabs special attention to understand their importance in maintaining environmental balance.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
3	-	3	-	3	70	30	-	-	100

Unit	Content	Lectures	Weightage
1	**Unit 1:- Microorganisms and their Habitats** ✓ Structure and function of ecosystem, ✓ Terrestrial Environment: Soil profile and soil microflora ✓ Aquatic Environment: Microflora of fresh water and Marine habitats Atmosphere: Aeromicroflora and dispersal of microbes ✓ Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body. ✓ Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. ✓ Microbial succession in decomposition of plant organic matter	15	33%
2	**Unit 2:- (A) Microbial Interactions** ✓ Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation ✓ Microbe-Plant interaction: Symbiotic and non symbiotic interactions ✓ Microbe-animal interaction: Microbes in ruminants ✓ Nematophagus fungi and Symbiotic Luminescent bacteria **(B) Biogeochemical Cycling** ✓ Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin ✓ Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction ✓ Phosphorus cycle: Phosphate immobilization and solubilisation ✓ Sulphur cycle: Microbes involved in sulphur cycle ✓ Other elemental cycles: Iron and manganese	15	34%
3	**Unit 3:- (A) Water Potability** ✓ Treatment and safety of drinking (potable) water, ✓ Methods to detect potability of water samples: (a) Standard qualitative procedures: presumptive test, confirmed and completed tests for detection of fecal coliforms (b) Standard Quantitative Procedures: SPC & MPN, (c) Membrane filtrationr technique & (d) Presence/absence tests **(B) Waste Management** ✓ Solid Waste management: Sources and types of solid waste ✓ Methods of solid waste disposal (composting and sanitary landfill)	15	33%

	✓ Liquid waste management: Composition and strength of sewage (BOD and COD), ✓ Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment		

Learning Outcome:
The students will learn about the role that microorganisms play in environment to carry out different biogeochemical cycling of elements, interactions between the microbes that are positive, negative or neutral to the environment, and also the applied aspect such as microbial waste and water management.

Reference Books:

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
2. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York
5. Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
7. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
8. Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
9. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
10. Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.
11. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.
12. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education